REMARKS

The Amendments

Claims 9 (from which claims 10 and 11 depend) and 12 have been amended to better describe the invention as a method including the step of removing from the resin substantially the same quantity of anions during regeneration that was transferred during the previous deposition cycle. The amendments are supported throughout the specification, and particularly in Examples 1 and 4. Applicants respectfully submit that the amendments add no new matter to the application, and earnestly solicit entry thereof.

Dependent claims 13 and 14 have been added. These claims depend from claims 9 and 12, respectively, and specifically recite that the heat stable anions comprise thiocyanate. These new claims are supported throughout the specification, particularly in the Summary of the Invention at page 3, the first paragraph at page 5, and Examples 1, 2, 4, and 5. No new matter is added to the application by these claims, and Applicants earnestly solicit their entry.

The Office Action

Claims 9-12 stand rejected (1) under 35 U.S.C. § 112, ¶ 1, for failure of the application as filed to describe the claimed invention and (2) under 35 U.S.C. § 251 for adding new matter to the application. The Office Action recites that the phrase "removes from the resin substantially all heat stable anions" requires removal of exactly those anions that were transferred during the previous deposition cycle, and the application as filed does not to show that invention.

Claims 1-12, all claims then pending, stand rejected under 35 U.S.C. § 112, ¶ 2, for failing to particularly point out and distinctly claim the subject matter Applicants regard as the invention. Each claim recites "Type II strong base anion exchange resin," but the specification is said not to describe what a Type II resin is.

Remarks

Applicants respectfully traverse these rejections. Applicants have amended claims 9-12 to better describe the invention, clarifying the claims and ensuring that the invention claimed is the subject matter Applicants regard as the invention. Further, Applicants respectfully submit that the skilled practitioner recognizes what a "Type II" resin is. Applicants submit herewith evidence in the form of a Declaration of Dr. Arthur L. Cummings, one of the inventors. The Declaration discusses the documents identified in the Office Action and summarizes several documents published by resin sellers. These seller's informational documents are identified as Documents A-O attached to the Declaration. These documents describe both Type I and Type II strong base anion exchange resins and are consistent with each other, i.e., each seller characterizes Type I strong base anion exchange resins in the same way and each seller characterizes Type II strong base anion exchange resins in the same way. This evidence establishes that a skilled practitioner knows what a Type II strong base anion exchange resin is, and can distinguish a Type II strong base anion exchange resin from a Type I strong base anion exchange resin.

The Rejections Under 35 U.S.C. § 112, ¶ 1, and 35 U.S.C. § 251

Claims 9-12 stand rejected under 35 U.S.C. § 112, ¶1, and 35 U.S.C. § 251 because there is no evidence that Applicants remove during regeneration exactly those

anions transferred to the resin in the previous deposition step. Applicants respectfully traverse this rejection. Applicants have amended independent claims 9 (from which claims 10 and 11 depend) and 12 to better define the invention by deleting "all" and inserting "the same quantity of" into the claims. This amendment clarifies that it is not precisely the same anions, but is substantially the same quantity of anions, that is removed during regeneration. Thus, it is clear that this step of the invention is directed to, *inter alia*, removal of substantially the same quantity of anions as were transferred to the resin in the previous deposition cycle.

Applicants respectfully submit that the claim amendment traverses the rejection under 35 U.S.C. § 112, ¶ 1, by clarifying that the claims are not directed to removal of substantially all of precisely those anions transferred to the resin in the previous deposition cycle. Applicants respectfully submit that the amendment traverses the "new matter" rejection under 35 U.S.C. § 251 as the specification, particularly Examples 1 and 4, illustrates removal of substantially the same quantity of anions as were transferred in the previous deposition cycle.

The Rejection under 35 U.S.C. § 112, ¶ 2

All claims stand rejected under 35 U.S.C. § 112, ¶ 2, for failing to particularly point out and distinctly claim the subject matter Applicants regard as the invention. Confusing and erroneous disclosures in the prior art (the specification of Crovato, US 5,692,461) and labeling of various equilibrium isotherms as "Types" (Perry's Chemical Engineers' Handbook, Fifth Edition), are said to preclude a skilled practitioner from having fair notice of the precise limits of the claimed invention.

Applicants respectfully traverse the rejection. Applicants respectfully submit that skilled practitioners recognize and understand the difference between Type I and Type II strong base anion exchange resins, and understand the subject matter Applicants regard as the invention. Further, skilled practitioners easily recognize that the specification of Crovato is erroneous in its suggestion that the difference between Type I and Type II strong base anion exchange resin is the identity of the anion (Cl^- or OH^-) attached thereto. Also, skilled practitioners recognize that the "types" of isotherms described in Perry's Handbook, Fifth Edition relate to binary equilibrium isotherm types, and not to strong base anion exchange resin types.

Applicants submit herewith the Declaration of Dr. Arthur L. Cummings, one of the named inventors. Dr. Cummings' Declaration discusses the documents identified in the Office Action, especially Crovato, and points out the error therein. Dr. Cummings' Declaration also identifies and discusses several documents received from resin sellers. These documents define the salient properties and characteristics of both Type I and Type II strong base anion exchange resins. Many of these documents pre-date both the earliest filing date of the original application herein and the earliest filing date of the Crovato application. Some documents are undated. These documents demonstrate beyond peradventure that identification of a strong base anion exchange resin as a "Type II" resin limits that resin with particularity. The Declaration also discusses the equilibrium isotherms from Perry's Handbook, Fifth Edition, and why they are not relevant to the strong base anion exchange resin disclosures herein. Thus, all claims pending herein particularly point out and distinctly claim the subject matter Applicants regard as the invention.

The Documents Cited in the Office Action

Both Crits, US 4,267,159, and Boone, US 5,849,883, have the correct description and formulas for Type I and Type II strong base anion exchange resins. As described in Crits, as column 3, lines 39-45, Type I resins derive their functionality from trimethylamine, whereas Type II resins derive their functionality from dimethylethanolamine. Boone, as column 13, lines 39-59, describes the functional group of Type I strong base anion exchange resin as three methyl groups attached to a nitrogen atom. Similarly, Boone defines the functional group of a Type II strong base anion exchange resin as having one of the methyls replaced by ethanol. Boone also sets forth the chemical/structural formulas of both Type I and Type II strong base anion exchange resins. Declaration, ¶¶ 8-9.

The description in Crovato, column 25, line 38, to column 26, line 45, is mistaken. The Type I strong base anion exchange resin structural formula contains an error (the moiety between the aromatic ring and the N atom should be $-CH_2-$, not $-CH_3-$, which would provide that C atom with 5 bonds). More importantly, the description of the differences between Type I and Type II strong base anion exchange resins is erroneous. Declaration, ¶ 10. Crovato erroneously describes, at column 26, lines 35-45, Sybron's Type I and Type II strong base anion exchange resins as differing in the anion moiety. Type I is said to be resin in the Cl^- form, whereas Type II is said to be resin in the OH^- form. This, simply, is wrong. Comparison of this erroneous explanation with any of the Sybron company literature (Documents A-D attached to and discussed in Dr. Cummings' Declaration) clearly shows the error. Crovato simply repeats the erroneous "Type I is in Cl^- form, Type II is in OH^- form" statement, whereas the Sybron documentation

illustrates the correct trimethylamine/dimethylethanolamine difference. Documents A-D also show that both Type I and Type II strong base anion exchange resins can exist in both the Cl^- and the OH^- forms. Declaration, ¶ 11-18.

Document D is a Sybron document that discusses strong base anion exchange resins generally, and relates to all Type I and Type II strong base anion exchange resins. Documents E, L, M, N, and O also discuss strong base anion exchange resins generally. As discussed below and as set forth in the Declaration, these documents are consistent and show the same trimethylamine/dimethylethanolamine difference between Type I and Type II strong base anion exchange resins. Declaration, ¶ 18, 19, 28, 31, 40-42.

Applicants respectfully submit that the greater weight of the credible evidence shows unequivocally that Crovato's description simply is erroneous. Documents D, E, L, M, N, and O directly contradict Crovato. Declaration, ¶ 17, 18, 20, 29, 32, 40-42. Together with the information set forth in the remaining Documents A-O, the argument set forth in the section headed *Additional Information* below clearly shows Crovato's error.

The binary equilibrium isotherm information set forth in Perry's Handbook, Fifth Edition, especially Fig. 16-8, has nothing to do with strong base anion exchange resins. The five 'types' described in Fig. 16-8 are merely illustrations of various isotherms used to judge whether adsorption and desorption will be 'favorable' or 'unfavorable' at a given temperature in a given separation system. The isotherm must be drawn for each different temperature under consideration. Declaration, ¶ 34-39.

Applicants respectfully submit that a skilled practitioner would not be confused by these five isotherm 'type' designations. These isotherm types are not related in any

way to strong base anion exchange resins. Rather, the skilled practitioner recognizes these isotherms for what they are, and recognizes that Type I and Type II strong base anion exchange resins have nothing to do with these equilibrium isotherm representations. Declaration, ¶ 37-39.

Additional Information

The descriptions of Type I strong base anion exchange resins and Type II strong base anion exchange resins set forth in Crits and Boone are consistent with those set forth in the informational documents obtained from ion exchange resin sellers. Applicants respectfully submit that this information is more persuasive on this point than the description in Crovato. Indeed, the information from Sybron Chemicals Inc. relating to their products directly contradicts Crovato's description of these products.

Documents A-O were received directly from ion exchange resin sellers. Declaration, ¶ 5. These documents show that sellers of strong base anion exchange resins identify Type I strong base anion exchange resins in the same way, and each seller's Type I resins have the same structural formula as other sellers' Type I strong base anion exchange resins. Similarly, these documents show that sellers of Type II strong base anion exchange resins identify Type II strong base anion exchange resins in the same way, and each seller's Type II resins have the same structural formula as other sellers' Type II strong base anion exchange resins.

Documents A-D were obtained from Sybron Chemicals Inc. Documents A and B describe the functionality of two identified Type I strong base anion exchange resins as trimethylamine (both documents, first paragraph and "Functional Structure" (second item under "Typical Characteristics" in the right column)). Documents A and B also report

the maximum amount of swelling expected when these Type I strong base anion exchange resins are converted from the Cl^- form to the OH^- form ("Typical Characteristics – Swelling ($Cl^- \rightarrow OH^-$)"). Thus, it can be seen that Type I strong base anion exchange resin has a trimethylamine functional group and can exist in both the Cl^- form and the OH^- form. Declaration, ¶ 12.

Document C addresses the functionality of a Sybron Type II strong base anion exchange resin. As can be seen in the first paragraph and at "Functional Group" under "Typical Characteristics," the functional group of this Type II strong base anion exchange resin is the dimethylethanolamine group. Also, swelling of the resin when it is converted from the Cl^- form to the OH^- form is set forth. Thus, it can be seen that this Type II strong base anion exchange resin has a dimethylethanolamine functional group and can exist in both the Cl^- form and the OH^- form. Declaration, ¶ 13-14.

Document B and Document C are dated "12/89" on the lower right and left corners, respectively, of the last page. Declaration, ¶ 16.

Document D is the relevant page of a document co-authored by Sybron Chemicals Inc. employees. This document is dated "10/86" in the lower right corner of the last page. Declaration, ¶ 15-16.

This document illustrates that Type I strong base anion exchange resins have a trimethylamine configuration, and that Type II strong base anion exchange resins have a dimethylethanolamine configuration. See structural formulas, left column. This Sybron document illustrates the structures of Type I and Type II strong base anion exchange resins generally. Declaration, ¶ 15. The specific disclosures of Documents A-C are consistent with this general disclosure. These documents illustrate that Crovato simply is

wrong regarding the properties and characteristics of strong base anion exchange resins. Declaration, ¶ 17-18.

Document E is a general description of ion exchangers sold by Dowex. This 1987 document (see last page) includes a descriptive paragraph on strong base anion exchange resins bridging the columns of page 4. There, Type I strong base anion exchange resin is described as incorporating quaternary methylamines (i.e., a trimethylamine), whereas Type II strong base anion exchange resin uses dimethylethanolamine. Declaration, ¶ 19. Document E contradicts Crovato. Declaration, ¶ 20.

Documents F-K relate to specific strong base anion exchange resin products sold under the Purolite name. Documents F and G are directed to Type I strong base anion exchange resins. In the shaded box of each document, the "Functional Groups" are described as trimethylamine, and "Swelling ($Cl \rightarrow OH$)" is listed in each document. Declaration, ¶ 21-22.

Similarly, Documents H-K are directed to Type II strong base anion exchange resins. In the shaded area of each document, the "Functional Group" of each resin is described as dimethylethanolamine, and the swelling observed in converting from the Cl^- form to the OH^- form is set forth. Declaration, ¶ 23-24.

Document F is dated "5/92" and Document H is dated "4/92." The others are undated. Declaration, ¶ 21, 23. Documents F-K contradict Crovato. Declaration, ¶ 25, 26.

Document L is a selected portion of a learned treatise, *Ion Exchange, Principles and Applications*, reprinted by Rohm & Haas, a resin seller. This document is undated, but was in MPR's possession in 1993. Declaration, ¶ 28. At page 397, strong base anion

exchange resins are discussed. In the paragraph beginning about two-thirds of the way down the left column, Type I is described as strong base anion exchange resin having a benzyl trimethyl ammonium group, and Type II is described as strong base anion exchange resin having benzyldimethylethanolammonium groups. Both descriptions are the same as the trimethylamine/dimethylethanolamine descriptions. Declaration, ¶ 28.

Document L describes Type I and Type II strong base anion exchange resins unambiguously and without reference to the seller thereof. Declaration, ¶ 28. Document L contradicts Crovato. Thus, Applicants respectfully submit that a skilled practitioner would be able to separately identify both Type I and Type II strong base anion exchange resins based on the teachings of this document alone. Declaration, ¶ 29.

Document M ("Fundamentals of Ion Exchange") is a transcript of an oral presentation given in 1989. Declaration, ¶ 30. Document M contains a description of fundamental concepts and general information about ion exchange. A section directed to strong base anion exchange resins begins at page 96. The document relates use of ion exchange to treatment of water. Declaration, ¶ 30, 31.

Document M teaches that Type I strong base anion exchange resin was the first type made, with Type II developed thereafter. "The Type I uses trimethylamine to form the exchange site; Type II uses dimethylethanolamine, which has an alcohol in place of one of the methyl groups." Page 96, last paragraph. Declaration, ¶ 31. As is true of each of Documents A-L, Document M directly contradicts Crovato. Declaration, ¶ 32. Applicants respectfully submit that a skilled practitioner would be able to separately identify both Type I and Type II strong base anion exchange resins based on the teachings of this document alone. Declaration, ¶ 32.

Document N is a portion of a Table from *Perry's Chemical Engineers' Handbook*, Seventh Edition. It describes Type I and Type II strong base anion exchange resins in the same way Documents A-M and O describe them - by distinguishing between the functional groups. Declaration, ¶ 40. The document shows that the isotherm types described in Perry's Handbook, Fifth Edition, are different from the resin types. Declaration ¶ 40. This document also contradicts Crovato. Declaration ¶ 40.

Document O describes synthesis of ion exchange resin generally and strong base anion exchange resin in particular. It describes attachment of the functional groups, trimethylamine for Type I, dimethylethanolamine for Type II. Declaration, ¶ 41, 42. This document contradicts Crovato and enables the skilled practitioner to identify a Type II resin.

Thus, the documents from each seller describe, for a given resin type, the same structural formula as is described in the other sellers' documents. Also, all of the documents describing particular resins indicate that both Type I and Type II strong base anion exchange resins exist in both the Cl^- form and the OH^- form. This indicates that the "Type I is Cl^-, Type II is OH^-" distinction set forth in Crovato cannot be correct. Declaration, ¶ 17, 18, 23, 24, 29, 32, 40-42.

Other documents were cited 'of interest' in the Office Action for various reasons, such as teaching use of NaCl as a regenerant and discussion of cyclic steady state. Applicants respectfully submit that these documents neither suggest nor disclose the claimed invention.

Summary

Applicants respectfully submit that all claims particularly point out and distinctly claim the subject matter Applicants regard as the invention. As set forth in Dr. Cummings' Declaration, the 'type' designations for strong base anion exchange resins are completely unrelated to the classification of isotherm types set forth in Perry's Handbook, and Crovato simply is wrong and against the weight of the credible evidence submitted herewith.

Further, the skilled practitioner knows not only what a Type II strong base anion exchange resin is, but also how to distinguish a Type II strong base anion exchange resin from a Type I strong base anion exchange resin. Resin sellers agree that a Type I strong base anion exchange resin has a trimethylamine functional group, and that a Type II strong base anion exchange resin has a dimethylethanolamine functional group. These functional groups are described both generally (Documents D, E, L, M, N, and O) with regard to strong base anion exchange resins and specifically with regard to products sold by strong base anion exchange resin sellers (Documents A-C and F-K).

These documents are freely available and the characteristics of the functional groups of each type of strong base anion exchange resin are known to both sellers and to users, i.e., skilled practitioners. These documents prepared by sellers are the best evidence of the properties and characteristics of the strong base anion exchange resins they sell, and clearly and consistently set forth the properties and characteristics of both Type I and Type II strong base anion exchange resins. Many were available before the earliest filing date of the original application herein.

Conclusion

Applicants have amended claims 9-12 to clarify that "substantially the same quantity" of anions as was transferred in the previous deposition cycle is removed during a regeneration cycle. Further, the skilled practitioner knows what a Type II strong base anion exchange resin is, and knows how to distinguish it from a Type I strong base anion exchange resin. Seller's informational literature, presented through the Declaration of Dr. Cummings, clearly shows that the structural formulas of both Type I and Type II resins were known before the earliest filing date of the original application. Therefore, Applicants respectfully submit that all claims specifically point out and distinctly claim subject matter Applicants regard as the invention, and enable a skilled practitioner to make and use the claimed invention. The other art cited of interest neither suggests nor discloses the claimed invention.

Applicants' petition for a three-month extension of the response period, to and including September 20, 2003. The Commissioner is authorized to charge the fee for the extension to our Deposit Account No. 19-0733. An Information Disclosure Statement identifying documents A-O attached to Dr. Cummings' declaration is filed herewith. It is believe that no other fees are due. However, the Commissioner is authorized to charge any fees necessary to enter the amendments and to reconsider this application to our Deposit Account No. 19-0733.

For all these reasons, Applicants respectfully submit that the claims are in condition for allowance and earnestly solicit favorable action thereon.

Respectfully submitted,

Dated: September 10, 2003 By: William J. Fisher

William J. Fisher
Reg. No. 32,133

BANNER & WITCOFF, LTD.
Eleventh Floor
1001 G Street, N.W.
Washington, D.C. 20001
(202) 824-3000

548908